

Aging with Diabetes: Sense of Coherence and Satisfaction with Life in European Older Adults with Type 2 Diabetes

Sofia von Humboldt¹, Isabel Leal¹, Susana Santos¹ & Georgeta Niculescu²

¹ Research Unit in Psychology and Health, R&D, ISPA – Instituto Universitário, Lisbon, Portugal

² Romanian Association of Person-Centered Psychotherapy, Bucharest, Romania

Correspondence: Sofia von Humboldt, Research Unit in Psychology and Health, R&D, ISPA – Instituto Universitário. Rua Jardim do Tabaco, 34, 1149-041 Lisboa, Portugal. Tel: 351-218-811-700. E-mail: sofia.humboldt@gmail.com

Received: October 14, 2012 Accepted: December 7, 2012 Online Published: February 18, 2013

doi:10.5539/res.v5n1p1

URL: <http://dx.doi.org/10.5539/res.v5n1p1>

Abstract

Objectives: The population's increased longevity is leading to a worldwide concern about older adults' well-being and about the incidence of chronic diseases such as diabetes. The present research intends to: (a) determine significant differences among three groups of older adults with diverse diabetes diagnosis, namely, participants with only type 2 diabetes, participants with diabetes and other chronic diseases and the remaining without any chronic disease, regarding the satisfaction with life (SWL) and sense of coherence (SOC) scores, and (b) to assess the association of SWL with SOC in these groups.

Method: We recruited 304 non-institutionalized older adults aged between 74-100 years ($M=82.9$; $SD= 6.71$), who were allocated to three groups, according to their diagnosed medical condition. Measures were completed, including demographics, the Satisfaction with Life Scale and the Orientation to Life Questionnaire.

Results: Significant differences were found regarding the SWL and SOC among the three groups. The lowest SOC and SWL scores were found in the 'only diabetes' group. Findings also indicated the existence of an association between SOC and SWL scores in the with 'only diabetes' group. No correlations were found between SOC and SWL scores in the 'without diabetes' and 'with diabetes and other' groups.

Conclusions: Findings suggest that chronic diseases such as diabetes, as well as the existence of comorbidities, differently influence both SWL and SOC. Furthermore, this study discloses the importance of SWL and SOC for the elderly, in particular when in the presence of diabetes, and their relevance in the context of healthy aging in older populations.

Keywords: chronic diseases, diabetes, older adults, satisfaction with life, sense of coherence

1. Introduction

Population aging is a global demographic phenomenon. Indeed, the World Health Organization predicts that by 2025, there will be 1.2 billion people with more than 60 years of age. In particular, the very elderly (85 or over) who are the fastest growing age group, are expected to largely exceed the number of young people (World Health Organization, 2001). Moreover, the population's increased longevity is leading to a rapid growth of the older population with chronic non-communicable diseases like diabetes (World Health Organization, 2012). Hence, there is a growing worldwide concern by public policies to enable older adults to maintain their independence and well-being as well as to respond effectively to the many challenges inherent to old age (Strine, Chapman, Balluz, Moriarty, & Mokdad, 2008).

The worldwide prevalence of diabetes among adults (aged 20-79 years) affected 385 million individuals in 2010 and is expected to rise 54% by 2030 (Hu, 2011; International Diabetes Federation, 2012; Shaw, Sincree, & Zimmet, 2009). According to the International Diabetes Federation (2011), type 2 diabetes is accountable for at least 90% of all cases of diabetes. In particular, diabetes in older adults has become a major public health problem (Munshi et al., 2006). Half of the currently affected individuals are over 60 years of age, but the highest prevalence is found in those who are over 80 years of age, a number estimated to reach 40 million by 2050 (Gambert & Pinkstaff, 2006). In fact, *Diabetes Mellitus* is a chronic disease that requires several adjustments in patient's lifestyle and has been referred to as the most demanding of all chronic diseases in terms of management

(Pretorius, Walker, & Esterhuyse, 2009; Sridhar & Madhu, 2002). Because it is an incurable disease, diabetes has to be managed through a strict daily regimen of medication, use of insulin, exercise and diet. These patients are, therefore, faced with behavioral and psychological challenges that put them on an increased risk of developing several co-morbidities (Pretorius, Walker, & Esterhuyse, 2009). Moreover, both old age and diabetes are independently associated with increased risk of cognitive dysfunctions (Munshi et al., 2006), as well as an increased risk of psychological distress, anxiety, depression, hypertension, mood disorders, and functional impairment, therefore, affecting negatively patients' well-being (Munshi et al., 2006; Pretorius, Walker, & Esterhuyse, 2009; Sacco & Yanover, 2006; Strine et al., 2008). People with diabetes, however, do not display uniform psychological reactions when confronted with this chronic disease, thus, more attention should be given to the patients' well-being, namely the level of satisfaction with life (SWL) (Pretorius, Walker, & Esterhuyse, 2009), as well as the sense of coherence (SOC) (Antonovsky, 1987; Antonovsky, 1993; Eriksson & Lindstrom, 2006). These measures can help explaining the intra-individual differences, while facing this disease, in order to enable older populations to accomplish a more positive and active aging (Brown, Bowling, & Flynn, 2004).

In this context, SWL is defined as the overall cognitive appraisal of one's subjective well-being, a comparison reflecting the perceived discrepancy between one's aspirations and achievement (Brown, Bowling, & Flynn, 2004; Diener, Emmons, Larsen, & Griffin, 1985). Thus, greater SWL is attained if there is little discrepancy between perceived life circumstances and achievements and one's standards of comparison. SWL is a long-standing cognitive evaluation of past, present and general life, and is considered to be relatively stable from middle to old age (Brown, Bowling, & Flynn, 2004; Diener et al., 1985). Additionally, SWL has been identified, along with physical health status, as essential for successful aging (Brown, Bowling, & Flynn, 2004), and has also been related to positive health predictors such as good self-reported health, social support, and positive health behaviors (Koivumaa-Honkanen et al., 2000; Strine et al., 2008). Conversely, life dissatisfaction is related to obesity and poor health behaviors such as smoking, heavy drinking, and physical inactivity, which are also associated with diabetes (Hu et al., 2001; Strine et al., 2008).

Furthermore, SOC refers to a global orientation that expresses the extent to which one has a persistent, though dynamic, feeling of confidence that comprehends three dimensions: 'comprehensibility', which refers that the stimuli deriving from one's internal and external environments in the course of living, are structured, predictable and explicable; 'manageability', which addresses the fact that there are resources available to meet the demands of these stimuli; and 'meaningfulness', indicative that these demands are challenges, worthy of investment and engagement (Antonovsky, 1987; Antonovsky, 1993; Eriksson & Lindstrom, 2006). A high level of SOC can be considered as a resource for health promotion that strengthens resilience and develops a state of health perceived as subjectively positive (Eriksson & Lindstrom, 2006). Moreover, older adults with stronger SOC are less prone to perceive most challenges as potentially dangerous (Antonovsky & Sagy, 2001). In fact, SOC is a strong determinant of positive health and successful coping (Dragaset et al., 2008). Moreover, for older people living within the community or in clinical settings, SOC has been shown to be associated with health-related well-being and quality of life (Dragaset et al., 2008).

In view of the limited number of studies that relate these two constructs among older adults, particularly in the presence of chronic diseases such as diabetes, this research aims to help bridging this gap. Therefore, our purposes with this study are: (a) to determine whether significant differences are found between three groups with diverse diabetes diagnosis ('only diabetes'; 'diabetes and other'; and 'no diabetes'), regarding the SWL and SOC scores, and (b) to assess the association of SWL with SOC in the three cited groups. Results suggest that the hypothesized link between the two concepts may exist.

2. Method

2.1 Participants

The total sample comprised 304 eligible non-institutionalized subjects, aged 74 and over ($M=82.87$; $SD= 6.71$; range 74-100), 57.2% female, 26.0% German and 52.0% professionally inactive. Two hundred and four participants were diagnosed with type 2 diabetes; among these, 50.2% indicated having other diseases besides type 2 diabetes. The sampling of the participants was based on the availability of respondents, through local community and health centre's list serves. The criteria to classify the type of disease were based on medical reports and according to the World Health Organization's classification for *Diabetes Mellitus* (World Health Organization & International Diabetes Federation, 2006). Inclusion criteria included the absence of concurring severe mental disorders according to DMS-IV, whereas participants who had difficulties completing the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & Mchugh, 1975), were excluded. Table 1 shows the socio demographic and health-related characteristics of the study participants.

Table 1. Distribution of the study participants according to socio demographic and health- related characteristics

	Only diabetes		Diabetes and other		No diabetes		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
<i>N</i>	101		102		101		304	100
Age (<i>M;SD</i>)	86.60 (5.926)		82.87 (6.714)		87.09 (6.476)		85.51 (6.636)	
Gender								
Male	39	38.6	46	45.1	45	44.6	130	42.8
Female	62	61.4	56	54.9	56	55.4	174	57.2
Nationality								
Portuguese	11	10.9	56	54.9	9	8.9	76	25.0
German	14	13.9	9	8.8	56	55.4	79	26.0
Romanian	20	19.8	19	18.6	33	32.7	72	23.7
English	56	55.4	18	17.7	3	3.0	77	25.3
Marital Status								
Not married or in a relationship	37	36.6	40	39.2	34	33.7	111	36.5
Married or in a Relationship	64	63.4	62	60.8	67	66.3	193	63.5
Education								
Primary School	21	20.8	31	30.4	15	14.9	67	22.0
Middle School	33	32.7	24	23.5	16	15.8	73	24.0
High School	36	35.6	39	38.2	36	35.6	111	36.5
University degree or higher	11	10.9	8	7.9	34	33.7	53	17.5
Professional Status								
Active	37	63.4	36	35.3	73	72.3	146	48.0
Inactive	64	36.6	66	64.7	28	27.7	158	52.0
Perceived Health								
Poor	74	73.3	85	83.3	34	33.7	193	63.5
Good	27	26.7	17	16.7	67	66.3	111	36.5
Income								
<10 000€	31	30.7	11	10.8	18	17.8	60	19.7
10 001-20 000€	49	48.5	60	58.8	48	47.5	157	51.6
20 001-37 500€	11	10.9	26	25.5	7	6.9	44	14.5
37501-70000€	6	5.9	3	2.9	18	17.8	27	8.9
>70001€	4	4.0	2	2.0	10	10.0	16	5.3

2.2 Measures and Procedure

The sampling of participants was based on the availability of respondents, and they were recruited by a non-probabilistic sampling procedure. Three hundred and four subjects gave their informed consent after the presentation of the study. The participants were then allocated to three different groups, according to their diagnosed diseases ('only diabetes'; 'diabetes and other'; and 'no diabetes') to proceed with the subsequent statistical analyses.

The Orientation to Life Questionnaire (OLQ) and the Satisfaction with Life Scale (SWLS) were used, as well as demographics, to comprehensively characterize the main outcomes of this study. Participants' SOC was assessed with the OLQ developed by Antonovsky (1987). The OLQ is composed of 29 items asking participants to indicate their level of agreement on a seven-point Likert-type scale, to items such as 'When you talk to people, do you have the feeling that they don't understand you?' and 'Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?'. Negative items were reverse scored so that higher scores on this scale indicate greater levels of SOC (Antonovsky, 1987; Antonovsky, 1993). In 26 studies using OLQ, the Cronbach alpha measure of internal consistency has ranged from .82 to .95, and the relatively few test-retest correlations show considerable stability, e.g. .54 over a 2-year period among retirees (Antonovsky, 1993).

The SWLS (Diener et al., 1985) was used to determine the participants' cognitive appraisal of their overall, subjective well-being. The SWLS is a five-item, self-report measure presented on a 7-point Likert-type scale that ranges from 'strongly disagree' to 'strongly agree' to items such as 'In most ways my life is close to my ideal.' or 'I am satisfied with my life' (Diener et al., 1985). Diener and colleagues' original study indicated an alpha coefficient equaling .87 (Diener et al., 1985). Subsequent studies have examined the internal consistency of the SWLS and alpha coefficients have continually exceeded .80 (Corrigan, 2000).

2.3 Statistical Analyses

Data was first analyzed to check for outliers and distribution forms. No missing value imputation was made. Second, data was analyzed through descriptive statistics for the demographic variables, SWL and SOC. In the current study, the Cronbach alpha coefficients for OLQ and for SWLS were .82 and .70, respectively, thus, we considered them to have satisfactory levels of reliability.

In order to determine whether the SOC and the SWL scores had normal distribution as well as homogeneity of variance between groups, Kolmogorov-Smirnov and Modified-Levene Equal-Variance tests were conducted.

Additionally, comparisons between the three groups, were performed, using One Way ANOVA followed by a Tukey's test, in order to analyze if these diverged significantly concerning the SOC and the SWL' scores.

Finally, in order to check whether there were correlations between the SOC and SWL scores on the three groups of individuals, Spearman correlations were calculated.

Data were analyzed using SPSS for Windows (version 19.0; SPSS Inc., Chicago, IL).

3. Results

Descriptive statistics (Table 2) show the means and standard deviation of SOC and SWL scores on the three groups.

Table 2. Means and standard deviation of SOC and SOC dimensions and SWL scores on the three groups of participants

	Only diabetes		Diabetes and other		No diabetes	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
SOC	3.73	.696	4.06	.560	4.16	.632
Comprehensibility	4.23	1.150	4.61	.190	4.37	1.047
Manageability	4.53	1.300	4.19	.761	4.70	1.271
Meaningfulness	2.03	.678	3.13	1.383	3.19	.904
SWL	3.64	.781	3.79	.534	4.13	1.247

M=Mean; *SD*= Standard Deviation

The ANOVA test indicated that the SOC score presented significant differences between at the least two groups ($F(2)=12.790, p<.001$). Post hoc comparisons of means (Tukey's honestly significant difference) indicated that the 'diabetes and other' participants had a significantly higher SOC score than the 'only diabetes' participants ($M=.330, p<.05$). The 'no diabetes' participants had a significantly higher SOC score than the 'only diabetes' group ($M=.431, p<.05$) (see table 3).

As regards to the SWL score, the ANOVA also indicated that there are significant differences between at the least two groups ($F(2)=7.598, p<.01$). Post hoc comparisons of means (Tukey's honestly significant difference) (table 3), indicated that the 'diabetes and other' participants had a significantly lower SWL score than the 'no

diabetes' group ($M=-.335$, $p<.05$). Finally, this latter had a significantly higher SWL score than the 'only diabetes' group ($M=.483$, $p<.05$).

Table 3. SOC Total and SWL -Tukey's HSD Multiple Comparison Test

			95% Confidence	Interval
	Mean		Lower	Upper
	Difference	Std. Error	Bound	Bound
SOC				
‘Only Diabetes’ vs ‘Diabetes and iOther’	.330*	.089	.12	.54
‘Diabetes and Other’ vs ‘No Diabetes’	-.101	.083	-.31	.11
‘No Diabetes’ vs ‘Only Diabetes’	.431*	.089	.22	.64
SWL				
‘Only Diabetes’ vs Diabetes and iOther’	.149	.127	-.15	.45
‘Diabetes and Other’ vs ‘No iDiabetes’	-.335*	.127	-.63	-.04
‘No Diabetes’ vs ‘Only Diabetes’	.830*	.127	.18	.78

Note: * $p\leq .05$

Spearman correlations were then calculated (see Table 4). A moderate positive correlation between the total SOC score and SWL ($r=.447$, $p\leq .01$) on the 'only diabetes' group was found. In detail, and when comparing the SOC dimensions with SWL, a higher association was observed between the score of 'manageability' and SWL ($r=.493$, $p\leq .01$). Finally, there was a weak correlation between 'meaningfulness' and SWL ($r=.207$, $p\leq .05$). A weak positive correlation between the scores of 'manageability' and SWL ($r=.218$, $p\leq .01$) as well as an also weak but negative correlation between 'meaningfulness' and SWL ($r=-.201$, $p\leq .05$) was found on the 'diabetes and other' group. No correlations were found between SOC and SWL scores on the 'no diabetes' group.

Table 4. Bivariate associations for SOC, SOC subscales and SWL

	1	1.1	1.2	1.3	2
Only Diabetes					
1. SOC	1				
1.1.Comprehensibility	.658**	1			
1.2.Manageability	.745**	.141	1		
1.3.Meaningfulness	-.261**	-.032	.046	1	
2.SWL	.447**	.111	.493**	.207*	1
Diabetes and Other					
1.SOC	1				
1.1.Comprehensibility	.503**	1			
1.2.Manageability	.614**	.081	1		
1.3.Meaningfulness	.537**	-.163	.111	1	
2.SWL	.142	.164	-.165	-.058	1
No Diabetes					
1. SOC	1				
1.1.Comprehensibility	-.096	1			
1.2.Manageability	.218	-.038	1		
1.3.Meaningfulness	-.207	.128	-.166	1	
2.SWL	.047	-.096	.218**	-.207*	1

Note: * $p\leq .05$; ** $p\leq .01$

4. Discussion

This study aimed at analyzing significant differences amongst the three groups of patients with different diagnoses ('only diabetes', diabetes and other' and 'no diabetes'), regarding the SWL and SOC scores, and at exploring the association between the SOC score (and its dimensions) with the SWL score, in the three groups.

Notably, results show that there are significant differences between the three groups of patients, concerning the scores obtained in both scales. These outcomes are corroborated by previous studies that underline that better well-being is accompanied by optimal functioning of multiple physiological systems (Singer & Ryff, 2001). In fact, according to Lima and colleagues (2009), the quality of life of older adults is significantly reduced in the presence of a chronic illness, such as diabetes. Moreover, in a different study, it was found that diabetes' prevalence was associated with a significantly lower health-related quality of life in older adults (Graham et al., 2007), thus, our findings regarding the differences of these measures of well-being (SWL and SOC) between the three groups, came as no surprise. Indeed, people with chronic illness can lead an active and productive life when they are assisted, therefore the importance of preventive interventions among this population (Detaille, Gulden, Engels, Heerkens, & van Dijk, 2010). Furthermore, most well-being indicators that have been used in clinical settings are being increasingly applied to non-clinical care (Cambell, Braspenning, Hutchinson, & Marshall, 2003).

The lowest mean of SWL was, found in the 'only diabetes' group of participants. Previous research suggests that, the more destabilizing a medical condition is, the lowest the SWL (Strine et al., 2008). In a different study with older adults, SWL was found to be associated with situations related to their well-being and to the specific absence of diabetes (Joia, Ruiz, & Donalison, 2007). In fact, the different diagnoses of the participants of this study had different impacts on patient's lives and it is therefore expectable that this distinctly influences SWL.

Furthermore, SOC is known to be influenced by the psychosocial environment that surrounds us (Antonovsky, 1987; Antonovsky, 1993; Eriksson & Lindstrom, 2006), so the different challenges and difficulties that the three groups of patients in our study have to face, on a daily bases might explain the differences that we found amongst the three cited groups regarding SWL and SOC scores. The lowest mean for SOC score was also found in the 'only diabetes' group. In this group results show, however, good scores of 'comprehensibility' and 'manageability', essentials for a good self-management of the diagnosed condition (Langeland, Wahl, Kristoffersen, & Hanestad, 2007; Eriksson & Lindstrom, 2006), but had the lowest score of 'meaningfulness' of all the three groups. According to Collingwood (2012), it is not surprising that those with serious health problems score lower on 'meaningfulness'. Furthermore, the feelings of loss and grief triggered by the mourning process, related to the crises experienced by the onset of a traumatic or progressive chronic disease (Livneh & Antonak, 2005), might explain this last outcome. Meanwhile, as expected, the highest mean of SOC and SWL was found in the 'no diabetes' group of patients, as this is the group who needs the least to develop better resilience to overcome health challenges and increase mobilization of therapeutic resources (Langeland et al., 2007). In addition, as regards to the 'only diabetes' group, findings confirm the existence of a positive and moderate correlation between the SOC and SWL scores. In detail, associations were also found between two dimensions of SOC ('manageability', 'meaningfulness') and SWL. A chronic illness such as diabetes may be viewed as a major demanding life event which is characterized by a number of frequent stressful situations that cause severe challenges to adaptation to the disease (Heijmans et al., 2004). In addition, the term *chronic sorrow* has often been used to portray the grief experienced by patients with chronic illnesses. Unlike the sorrow associated with non-bodily losses, chronic diseases serves as a constant reminder of the permanency of the condition. Furthermore, health events on a daily basis, remind the patient of the enduring discrepancy between past and present or future situations (Livneh & Antonak, 2005). In order to overcome such challenges, a high SOC has been identified as a strong determinant of positive health and successful coping and has been associated with health-related quality of life and well-being (Dragaset et al., 2008). Therefore, in the case of the 'only diabetes' group, as expected, a higher SOC is associated with a greater SWL. Indeed, according to Antonovsky (1987), the stronger the SOC, the more easily individuals resist danger, damage, and join in activities that promote health, and greater the odds, that individuals, when faced with multiple stressors agents, which cannot be avoided, perceive such challenges as manageable and investment opportunities (Antonovsky, 1993; Eriksson & Lindstrom, 2006).

On the 'diabetes and other' group weaker correlations were found: a positive correlation between 'manageability' and SWL, and a negative correlation among 'meaningfulness' and SWL. Previous research associated SWL to the accomplishment of vital goals in all areas of life, such as the effective management of daily life, social interaction and occupational and leisure time activities (Snellman & Wikblad 2006). Successful management of chronic conditions depends mostly on adequate self-care. Patients with comorbid chronic diseases experience a wide range of barriers to self-care, including many that are specifically related to having multiple medical

conditions (Bayliss, Steiner, Fernald, Craane, & Main, 2003). Previous studies have shown that well-being is negatively affected by the number of concurrent chronic conditions, and that specifically, chronic comorbidity has the most negative effect on well-being (Momtaz, Hamid, Yahara, & Ibrahim, 2010). We can posit then, that the poor perceived health and well-being of these individuals, along with the more complicated health status of this group, leads to a more negative influence on both SWL and SOC, thus the weak association among these in this group, and, in particular, the negative association between 'meaningfulness' and SWL.

As expected, in the 'no diabetes' group, no correlations were found. Healthy individuals (whom in this study displayed the higher SOC and SWL scores) revealed an absence of association between these two variables. Physical health is seen as an important source of human well-being, and a number of studies have reported associations between subjective well-being (which comprises the SWL construct), and diverse health dimensions (Roysamb, Tambs, Reichborn-Kjennerud, Neale, & Harris, 2003). This group displayed the highest SWL and SOC scores, though that does not necessarily mean that these two measures are, in this case, related for this group of participants in our study. In this context, we initially expected higher SOC scores in this group, since stronger SOC is associated with better perceived health in general, a relation that has been manifested in previous studies, regardless of age, sex, ethnicity, nationality, and study design (Eriksson & Lindstrom, 2006). In addition, SOC seems to have a main, mediating role in the explanation of health, and seems even to be able to predict health (Eriksson & Lindstrom, 2006).

Despite the relevant findings in this study, a number of limitations must be considered. Selection bias may be a limitation, given that participants were recruited through community and health centers. Also, given our reliance only on self-report measures, generalization of results is in question. Furthermore, although significant differences were found between groups, their clinical relevance has yet to be determined. Therefore, these findings need to be interpreted for practical use in order to avoid overrating of differences, although the results showed statistical significance. Further studies should take these limitations into consideration in order to fully understand the relations between diabetes, SWL and SOC, two constructs potentially able to empower community-dwelling older adults to better overcome the difficulties inherent to a chronic illness such as diabetes. In particular, future work should focus on recruiting a larger sample and comparing the effects of diabetes on SOC and SWL with those of well-established diabetes-based interventions and other control conditions. Furthermore, we recommend using more fine-grained analyses of well-being by using other measures, such as a wide range assessment of subjective well-being and quality of life. Moreover, a longitudinal study may yield a more comprehensive analysis of the effects of diabetes on SWL and SOC for these patients, thus adding to our findings.

In brief, the present study focused on analyzing the potential differences between three groups of participants with different diagnoses, regarding SWL and SOC, as well as to assess associations between these two concepts in the three groups. Results showed that there are significant differences between the three groups regarding the SWL and SOC scores, and that these two constructs were associated in both the 'only diabetes' and 'diabetes and other' groups. These pertinent findings contribute to an understanding of diabetes beyond the medicalized approach that is common in the literature and enhance the important role played both by SOC and SWL in older patients' diabetes self-management and adaptation to their medical condition, within a salutogenic approach in combination with an ongoing healthy aging among older populations.

Acknowledgements

We kindly acknowledge the Portuguese Foundation for Science and Technology (FCT), for the grant [grant number SFRH/BD/44544/2008] which supported this research.

Conflict of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Sponsor's Role: The fund approved the design and aims of the study but did not play any role in the collecting of data, interpretation of results, or preparation of this article.

References

- Antonovsky, A. (1987). *Unraveling the mystery of health. how people manage stress and stay well*. San Francisco: Jossey Bass Publishers.
- Antonovsky, A. (1993). The structure and properties of the sense of coherence scale. *Social Science and Medicine*, 36(6), 725-733. [http://dx.doi.org/10.1016/0277-9536\(93\)90033-Z](http://dx.doi.org/10.1016/0277-9536(93)90033-Z)

- Brown, J., Bowling, A., & Flynn, T. (2004). Models of quality of life: a taxonomy, overview and systematic review of the literature. *European Forum on Population Ageing Research, 2004*. Sheffield, Department of Sociological Studies.
- Campbell, S. M., Braspenning, J., Hutchinson, A., & Marshall, M. N. (2003). Research methods used in developing and applying quality indicators in primary care. *Biomed Journal, 326*(7393), 816-819. <http://dx.doi.org/10.1136/bmj.326.7393.816>
- Collingwood, J. (2012). Your sense of coherence. Retrieved from <http://psychcentral.com/lib/2006/your-sense-of-coherence>
- Corrigan, J. (2000). Satisfaction with Life Scale. *The center for outcome measurement in brain injury*. Retrieved from <http://www.tbims.org/combi/swls>
- Detaille, S., Gulden, J., Engels, J., Heerkens, Y., & van Dijk, F. (2010). Using intervention mapping (IM) to develop a self-management programme for employees with a chronic disease in the Netherlands. *Biomed Central Public Health, 10*(353), 1-12. <http://dx.doi.org/10.1186/1471-2458-10-353>
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*, 71-75. http://dx.doi.org/10.1207/s15327752jpa4901_13
- Dragaset, J., Nygaard, A., Eide, G. E., Bondevik, M., Nortvedt, M. W., & Natvig, G. K. (2008). Sense of coherence as a resource in relation to health-related quality of life among mentally intact nursing home residents – a questionnaire study. *Health and Quality of Life Outcomes, 6*(85), 1-9. <http://dx.doi.org/10.1186/1477-7525-6-85>
- Eriksson, M., & Lindstrom, B. (2006). Antonovsky's sense of coherence and the relation with health: a systematic review. *Journal of Epidemiology and Community Health, 60*, 376-381. <http://dx.doi.org/10.1136/jech.2005.041616>
- Folstein, M., Folstein, S., & McHugh, P. (1975). Mini-Mental State: a practical method for grading the cognitive state of patients for clinician. *Journal of Psychiatric Research, 12*, 189-198.
- Gambert, S. R., & Pinkstaff, S. (2006). Emerging epidemic: Diabetes in older adults: demography, economic impact, and pathophysiology. *Diabetes Spectrum, 19*(4), 221-228. <http://dx.doi.org/10.2337/diaspect.19.4.221>
- Graham, J., Stoeber-May, D., Ostir, V., Snih, S., Peek, M. Markides K., & Ottenbacher, K. (2007). Health related quality of life in older Mexican Americans with diabetes: A cross-sectional study. *Health and Quality of Life Outcomes, 5*(39), 1-7. <http://dx.doi.org/10.1186/1477-7525-5-39>
- Heijmans, M., Rijken, M., Foets, M., De Ridder, D., Schreurs, K., & Bensing, J. (2004). The stress of being chronically ill: From disease-specific to task-specific aspects, *Journal of Behavioral Medicine, 27*, 255-271. <http://dx.doi.org/10.1023/B:JOBM.0000028498.16767.a2>
- Hu, F. (2011). Globalization of diabetes. *Diabetes Care, 34*, 1249-1257. <http://dx.doi.org/10.2337/dc11-0442>
- Hu, F. B., Manson, J. E., Stamfer, M. J., Colditz, G., Liu, S., Solomom, C. G., & Willet, C. (2001). Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. *The New England Journal of Medicine, 345*, 790-797 <http://dx.doi.org/10.1056/NEJMoa010492>
- International Diabetes Federation. (2012). *Diabetes atlas* (5th ed.). International Diabetes Federation, Brussels, Belgium.
- International Diabetes Federation. (2011). *Diabetes atlas. Epidemiology and mobility*. International Diabetes Federation, Brussels, Belgium.
- Joia, L. C., Ruiz, T., & Donalisio, M. R. (2007). Condições associadas ao grau de satisfação com a vida entre a população de idosos [Conditions associated with the life satisfaction among older populations]. *Revista de Saúde Pública, 41*(1), 131-138. <http://dx.doi.org/10.1590/S0034-89102007000100018>
- Koivumaa-Honkanen, H., Honkanen, R., Viinamaki, H., Heikkila, K., Kaprio, J., & Koskenvuo, M. (2000). Self-reported life satisfaction and 20-year mortality in healthy Finnish adults. *American Journal of Epidemiology, 152*, 983-991. <http://dx.doi.org/10.1093/aje/152.10.983>

- Langeland, E., Wahl, A. K., Kristoffersen, K., & Hanestad, B. R. (2007). Promoting coping: salutogenesis among people with mental health problems. *Issues in Mental Health Nursing*, 28, 275-295. <http://dx.doi.org/10.1080/01612840601172627>
- Lima, M. G., Barros, M. B. A., César, C. L. G., Goldbaum, M., Carandina, L., & Ciconelli, R. M. (2009). Impact of chronic disease on quality of life among the elderly in the state of São Paulo, Brazil: a population-based study. *Revista Panamericana de Salud Publica*, 25(4), 314-321. <http://dx.doi.org/10.1590/S1020-49892009000400005>
- Livneh, H., & Antonak, R. F. (2005). Psychosocial adaptation to chronic illness and disability: a primer for counselors. *Journal of Counseling & Development*, 83, 12-20. <http://dx.doi.org/10.1002/j.1556-6678.2005.tb00575.x>
- Madhu, K., & Sridhar, G. R. (2001). Coping with diabetes: A paradigm for coping with chronic illness. *International Journal of Diabetes in Developing Countries*, 21, 103-111.
- Momtaz, Y. A., Hamid, T. A., Yahaya, N., & Ibrahim, R. (2010). Effects of chronic comorbidity on psychological well-being among older persons in Northern Peninsular Malaysia. *Applied Research in Quality Life*, 5, 133-146. <http://dx.doi.org/10.1007/s11482-010-9098-2>
- Mushi, M., Grande, L., Hayes, M., Ayres, D., Suhl, E., Capelson, R., Lin, S. Milberg, W., & Weinger, K. (2006). Cognitive dysfunction is associated with poor diabetes control in older adults. *Diabetes Care*, 29(8), 1794-1799.
- Piette, J. D., Heisler, M., & Wagner, T. H. (2004). Problems paying out-of-pocket medication costs among older adults with diabetes. *Diabetes Care*, 27, 384-391. <http://dx.doi.org/10.2337/diacare.27.2.384>
- Pretorius, C., Walker, S. P., & Esterhuysen, K. G. F. (2010). Coping responses as predictors of satisfaction with life amongst a group of patients with diabetes mellitus. *Health SA Gesondheid*, 15(1), 513-518. <http://dx.doi.org/10.4102/hsag.v15i1.513>
- Røysamb, E., Tambs, K., Reichborn-Kjennerud, T., Neale, M. C., & Harris, J. R. (2003). Personality processes and individual differences, happiness and health: Environmental and genetic contributions to the relationship between subjective well-being, perceived health, and somatic illness. *Health Journal of Personality and Social Psychology*, 8(6), 1136-1146. <http://dx.doi.org/10.1037/0022-3514.85.6.1136>
- Sacco, W. P., & Yanover, T. (2006). Diabetes and depression: The role of social support and medical symptoms. *Journal of Behavioral Medicine*, 29, 523-531. <http://dx.doi.org/10.1007/s10865-006-9072-5>
- Shaw, J. E., Sincree, R. A., & Zimmet, P. Z., (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Research and Clinical Practice*, 87, 4-14. <http://dx.doi.org/10.1016/j.diabres.2009.10.007>
- Singer, B., & Ryff, C. D. (2001). *New horizons in health: an integrative approach*. Washington, DC: National Academy Press.
- Snellman, I., & Wikblad, K. (2006). Health in patients with type 2 diabetes: An interview study based on the welfare theory of health. *Scandinavian Journal of Caring Science*, 20, 462-471. <http://dx.doi.org/10.1111/j.1471-6712.2006.00447.x>
- Strine, T. W., Chapman, E. D. P., Balluz, E. L. S., Moriarty, D. G., & Mokdad, E. A. H. (2008). The associations between life satisfaction, chronic illness, and health behaviors among U.S. community-dwelling adults. *Journal of Community Health*, 33, 40-50. <http://dx.doi.org/10.1007/s10900-007-90666-4>
- World Health Organization. (2001). *The world health report*. Geneva, Switzerland: Author.
- World Health Organization. (2012). *World health statistics*. Geneva, Switzerland: Author.
- World Health Organization, & International Diabetes Federation. (2006). *Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia*. Geneva, Switzerland.
- Zhang, P., Zhang, X., Brown, J., Vistensen, D., Sicre, R., Shaw, J., & Nichols, G. (2010). Global healthcare expenditure on diabetes for 2010 and 2030. *Diabetes Resident Clinical Practice*, 87, 293-301. <http://dx.doi.org/10.1016/j.diabres.2010.01.026>